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COMPARING MAGNETIC RESONANCE IMAGING-BASED DEFINITIONS OF KNEE OSTEOARTHRITIS TO X-RAY-BASED KELLGREN-LAWRENCE GRADE FOR PREDICTING DISEASE SEVERITY

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Purpose: To compare magnetic resonance imaging (MRI) based definitions of knee osteoarthritis (OA) to x-ray-based Kellgren-Lawrence (KL) grade, for predicting disease severity, as measured by visual analogue Western Ontario and McMaster Universities (WOMAC) scales for pain (WP), function (WF) and stiffness (WS), as well as aggregate (WG).
Methods: We collected information from a population-based sample of 255 people age 40-79 with self-reported knee pain stratified by age and gender, between September 2002 and March 2005. The sample was weighted to represent the distribution of age (40-49, 50-59, 60-69, 70+) by gender using totals from the first stage of sampling. One hundred and sixty-three subjects were followed up a mean of 3.3 years later. WOMAC was elicited, and knee radiographs and MRIs taken at baseline and follow-up.
Radiographs were graded by KL (0 to 4 scale). MRI cartilage was graded on 6 surfaces (lateral femur, lateral tibia, medial femur, medial tibia, patella and trochlear groove) from 0 to 4. From these cartilage scores we calculated the categorized sum (MRISumCat) based on quintiles of the sum, and the maximum (MRIMax). MRISumCat was defined by the sum of MRI surfaces being in {0-2, 3-4, 5-9, 10-13, 14+}.
Using both baseline and followup data, we fit (cross-sectional) linear regression models predicting WOMAC from each definition of OA, with bootstrap adjustments for the complex sample and correlation within subjects. Definitions were judged by their model R-squares (proportion of WOMAC variance explained). Fit was assessed with an examination of residuals. We focused on the unadjusted models, since OA definitions are simplest when "standalone", meaning they can be applied uniformly across different groups (e.g., KL grade is not defined differently depending on age). Models adjusted for age, gender and body mass index were also fit for comparative purposes. All analyses were sample weighted.
Results: The results are summarized in Table 1. In the unadjusted models, all definitions are highly significant predictors of WOMAC (p-values not shown). MRISumCat explains the greatest proportion of WOMAC variance on all four outcomes: for WP, R-square = 6.03%; for WF, R-square = 9.67%; for WS, R-square = 10.00%; and for aggregate WG, R-square = 9.91%. For predicting WP, WF and WG, the best OA definition is MRISumCat, followed by MRIMax. For predicting WS, MRISumCat is the best, followed by KL. In adjusted models the R-squares are higher and KL outperforms MRIMax; MRISumCat remains the best overall, though slightly lower than KL for predicting WS.
It is of interest to note that these R-squares are low on a traditional scale, however there are many more factors influencing pain, function and stiffness than joint imaging. Considering this, the R-squares are not unreasonable, and the ranking of R-squares is the relevant result.
Conclusions: MRISumCat is an MRI-based definition of OA in knees that outperforms Kellgren Lawrence grade for predicting clinical disease severity as measured by WOMAC scales on pain, function and stiffness, as well as aggregate WOMAC. This may eventually lead to the development of new, MRI-based standards for OA disease classification.

Table 1. Summary of models predicting WOMAC from MRI- and KL-based OA definitions

Outcome	Definition	DF	R-square (%) (Unadj.)	R-square (%) (Adj.)
WP	MRIMax	4	4.34	5.83
	MRISumCat	4	6.03	9.21
	KL	4	3.96	7.85
WF	MRIMax	4	7.13	11.12
	MRISumCat	4	9.67	14.26
	KL	4	6.53	11.64
WS	MRIMax	4	5.62	9.56
	MRISumCat	4	10.00	12.31
	KL	4	7.45	12.86
WG	MRIMax	4	6.91	10.19
	MRISumCat	4	9.91	13.84
	KL	4	6.70	11.49

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PAIN AND DISABILITY IN EARLY KNEE OSTEOARTHRITIS

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Purpose: We've all heard people say: "I get this twinge every once in a while" or "I make my trips up and down the stairs count now. It saves my knees." Are these people describing early osteoarthritis (OA)? Little is known about people's experiences with pain and functional limitations in the early stages of knee OA. The purpose of this study was to quantify the pain, disability and participation restrictions in people with early versus moderate and end stage knee OA.
Methods: The sample included 95 individuals from the community with complaints of knee pain. They were assigned at study inception to: *Group 1-early OA:* 'pain, aching or stiffness in or around the knee' at any time in the past 12 months but NOT on most days for at least one month and not as a result of an injury. The individuals did not necessarily have a physician diagnosis of knee OA. *Group 2-moderate OA:* physician diagnosis of knee OA with symptoms on most days of the month but had never been told that they needed a knee replacement in the past nor in the upcoming year. *Group 3-end stage OA:* on a surgical list for total knee replacement. All participants had some degree of knee OA on x-ray. Participants completed the Intermittent and Constant OA Pain Measure (ICOAP), the Numeric Pain Rating Scale (NRS) where lower scores indicated less pain in both measures, KOOS ADL subscale (higher scores less disability), the KOOS-PS (lower scores less disability), and the Social Role Participation Questionnaire (SRPQ) (higher score less restrictions). Additionally, participants completed the OA Knowledge Questionnaire and the Brief Illness Perceptions Questionnaire as an evaluation of their cognitive and emotional perceptions of their knee problems. Descriptive statistics with 95% confidence intervals were calculated for each measure by group.
Results: Table 1 provides the description of the groups. Overall, more females participated in the study and there was a slightly higher proportion of males in the early OA group. Overall, those with early OA experienced less pain and disability than those with moderate or end-stage OA, with a tendency for this group to report less constant pain. Differences were statistically significant for the KOOS-PS (p=0.004, group 1 vs. other) and KOOS-ADL (p=0.02, group 1 vs other). However, only those with end-stage OA had reduced satisfaction with their ability to participate in social roles (Table 2). There were no differences in OA knowledge in the three groups; however, those with early OA reported less overall concern about their knee problems currently or for the future. In